

VI.—*Observations on the External Characters and Internal Anatomy of a Bitentaculate Slug found at the Island of Aneiteum, New Hebrides.* By JOHN DENIS MACDONALD, R.N.; Assistant-Surgeon of H.M.S.V. "Torch," Tender to H.M.S. "Herald," Capt. Denham, R.N., F.R.S., Commanding the Exploring Expedition in the South Seas.

[With a Plate.]

At the Island of Aneiteum, in the New Hebrides group, we obtained the only naked terrestrial Gasteropod with which we met during our late cruises amongst the South Sea Islands.

At first sight the animal appeared to be simply a moderately large species of *Limax*, but on closely examining two specimens which Mr. Macgillivray very kindly reserved for me, I noticed that they possessed but the two tentacula that supported the eyes. This character made the further study of their anatomy an object of some interest to me, and I have been induced to draw up the following account of it with the view of determining whether the species may be with propriety retained in, or separated from, the genus *Limax*.

The animal having the power of extending its body considerably, or of drawing it up in the longitudinal direction, and spreading it out laterally so as to assume a great variety of shapes, it would be rather difficult to state its proportions with any degree of certainty, but it appears to average about  $2\frac{1}{2}$  inches in length, by  $\frac{6}{8}$ ths of an inch in breadth. It is of a pale yellowish-brown colour, varying in depth in different individuals, and often sparingly mottled with a reddish-brown or black pigment over the dorsal region.

Along the middle line of the back a narrow groove extends from the nape to the obtusely pointed extremity of the tail, and from this primary groove, on either side, a number of smaller channels arise, which take a parallel course obliquely outwards and backwards to the thin margin of the foot, and communicate with each other laterally by the transverse interspaces between the soft mammillary elevations of the skin.

The mantle is of small superficial extent, lying on the right side of the body somewhat in advance of the centre, and circumscribed by a triangular sunken outline, with the angles gently rounded off. The base of the figure thus formed corresponds with the above-mentioned median groove, which is here slightly deflected to the left, while the outer rather obtuse angle is so deeply notched as to appear to be perforated by the respiratory opening. From the upper and anterior angle two depressed lines pass forwards, diverging so as to include the roots of the tentacula, on the outer side of which they are lost.

A remarkably stout scutellum with smoothly rounded extremities, presenting little of the scale-like character of the same organ in other Slugs, is enclosed between the layers of the mantle.

The tentacula arise directly from the head, having no connexion whatever with the mantle. They gradually diminish in size towards the free extremity, which is slightly dilated and of an oval form, containing the visual organs.

The roof of the mouth is furnished with a quadrilateral horny tooth, having a crescentic inferior or cutting edge, and from its intimate connexion with the buccal mass, rather than with the upper lip, it would remind one more of the upper mandible of Cephalopods than of its representative in the veritable members of the genus *Limax*.

The lingual sac and dental plates and tubercles very closely resemble those of *Limax*, *Helix*, and *Bulimus*. Thus, the sac itself is short and moderately wide, with a rounded fundus protruding a little from the buccal mass posteriorly. The lingual plates are subquadrilateral in figure, the outer and posterior borders being somewhat concave, and the anterior and internal slightly convex; and each plate supports a simple conical dental process inclining a little inwards, and having a small angular projection on either side of the base. The plates of the central series are quite rudimentary, each presenting a bifid anterior portion and a small and pointed posterior extremity. The latter characters, if they do not prove to be generic, may at least serve to distinguish the species.

The generative system is remarkable for the compactness of all its parts.

The ovarium (Pl. III. fig. 6 *i*) and testis (*k*) lie in contact with each other at about the middle of the dorsal region. The former, on the left side, gives origin to the small or primary oviduct (*l*), and the latter, on the right, is wrapped up, as it were, with the tortuous commencement of the larger oviduct or uterus (*m*), but both testis and ovarium are separated from the liver by the interposition of the stomach.

The *vas deferens* emerges from the smaller or anterior portion of the testis (*o*), winds in a dextral manner round the uterus, and having reached the union of the organs of both sexes, it crosses over to the left side and retrogrades upon the under surface of the retracted male organ so as to terminate near the insertion of the short retractor muscle (*p*), which arises from a point corresponding to the union of the foot with the dorsal integument on the left side.

The spermatheca (*q*) is of considerable size and filled with a purplish-brown secretion; but its duct, which arises from the

uterus, is so short, that the sac itself lies in contact with that tube. Now, in the common Slugs of England, the duct of the spermatheca has no immediate communication with the oviduct, but opens externally by a distinct orifice in the generative pit.

Near the commencement of the uterus there is a much smaller sac-like appendage (*m*), which may be a rudiment of the multified vesicles; organs which, although peculiar to the genus *Helix*, I have never seen in any of the numerous *Helices* which I have dissected in the Southern hemisphere.

The external respiratory opening leads into a small cavity with stout areolated walls, and a few little fenestrations in a small cribriform space establish a communication between this cavity and the pericardium; a condition which also most distinctly exists in *Nautilus Pompilius*.

The heart (*r*) holds a central position; a small auricle receives the return-blood from the respiratory surface on the right side, and the ventricle gives off its principal arterial trunk inferiorly, a tubular process of the pericardium encircling the vessel at its origin.

A large glandular body (*s*) arches over the viscera from the left to the right side immediately behind the heart, and pours forth its mucous secretion through the respiratory orifice. This gland is furnished with compressor muscles from the circular fasciculi of the integument. It is doubtless the homologue of what might be termed the renal gland of *Paludina* for example, or the renal follicles of *Nautilus*; and indeed the close relationship of the Gasteropoda with the Cephalopoda through the latter genus is well illustrated in many particulars in the little mollusk, the principal details of whose anatomy have just been given\*.

The only mollusk with which this may be confounded is the *Janella antipodarum* of Dr. Gray. The *primâ-faciè* probability of their identity was first suggested to me by Mr. Macgillivray in the following memorandum, which expresses the state of the question so concisely that I cannot refrain from inserting it, with that gentleman's permission:—

“*Limax bitentaculatus*, Quoy & Gaim. Voy. Astrolabe, t. 13. f. 1, 2, 3. From this description Gray formed a temporary genus under the name of *Janella*, in vol. iv. of ‘Mrs. Gray’s Mollusca.’ He has since, from receiving one in spirits, published the characters of the genus (in Ann. and Mag. of Nat. Hist. for Dec.

\* I have since ascertained that a bitentaculate Slug, answering in every respect to that above described, is indigenous to Port Stephens, New South Wales. Both unquestionably belong to the same genus, but not having the opportunity of comparing specimens, I cannot determine if any specific differences exist between them.



